Homework # 2 (short), Due Feb. 13th, 2007

Problem 1 Derive equivalent time-domain expressions for

$$\frac{d}{dt}u(t-5)$$

and

$$\frac{d^2}{dt^2}u(t)$$

in the sense of generalized functions. Please study the proof of $du(t)/dt = \delta(t)$ prior to answering this question.

Problem 2 Derive the Fourier Transforms of

$$\frac{d}{dt}u(t-5),\ \frac{d^2}{dt^2}u(t),\ \cos(\Omega_0 t - 3)u(t),\ \sin(\Omega_0 t - 5)u(t)$$

using properties of the Fourier Transform.

Notes: For full-credit for the second problem, you need to do the derivations by hand and verify your answers using Mathematica. Also, note: (i) the unit step function is represented by `UnitStep`, (ii) the impulse function is represented by `DiracDelta` and (iii) the Fourier Transform is evaluated using (for example): `FourierTransform[UnitStep[t], t, Ω, FourierParameters -> {1, -1}]` .